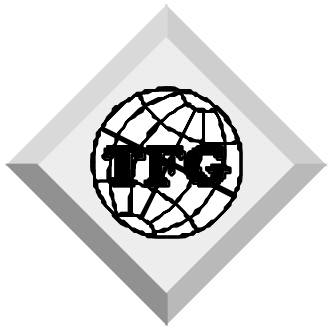
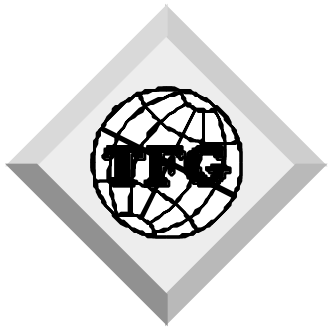


Terrain Feature Generator Technology Overview

Harold N. McDaniel

TFG Software Engineering Manager



Topics

- TFG System Overview
- Spatial Data Management
  - Problem Definition
  - Software Architecture
  - Database Architecture
  - Feature Linking
  - Output Support
- Spatiotemporality
- Summary

TFG System Overview

- Rapidly generate a geospatial database of terrain and attributed feature data over a given Area of Interest (AOI)
- Iteratively enhance this database by adding features extracted from current imagery
- Segregate the database contents over end-user selected regions

TFG System Overview

- Disseminate the segregated contents to the end-user

TFG System Overview

- Major software elements:
  - System Management & Source Assessment
  - Geolocation Data Processing
  - Terrain Data Generation
  - Spatial Data Management

Spatial Data Management - Problem Definition

- Provide low to medium resolution coverage over entire AOI
  - Small scale MC&G products
    - DCW
    - DTED 1
    - ADRG
    - JOGs

Spatial Data Management - Problem Definition

- Provide increasingly higher resolution over smaller and smaller geographic areas
  - Iterative process using both larger scale MC&G products and higher resolution imagery

Spatial Data Management - Software Architecture

- Implemented on Solaris x86 2.5 using basic X windows running under OpenWin
- Utilizes Intergraph's strong COTS topology legacy as software core
- Integration of Intergraph core with the ObjectStore OODBMS produced by Object Design Inc.

Spatial Data Management - Database Architecture

- Data added into the database from many sources, of varying accuracy and resolution, as it is needed by TFG
- Vector graphic data
- Object oriented, distributed, multi-file database
- Best view of the AOI terrain; contains all data currently integrated

Spatial Data Management - Database Architecture

- Multi-Level Structure
  - Vector database consists of three files each containing their own topology
  - All three files represent the same AOI, but at increasing levels of fidelity, data density and resolution
  - Data most likely to be requested at the same time would be stored together for faster access

Spatial Data Management - Database Architecture

- Three Levels of the Database:
  - Low Resolution
    - Scale 1:500,000 to 1:1,000,000
    - Digital Vector Source: DCW
  - Medium Resolution
    - Scale 1:250,000
    - Digital Vector Source: PITD

Spatial Data Management - Database Architecture

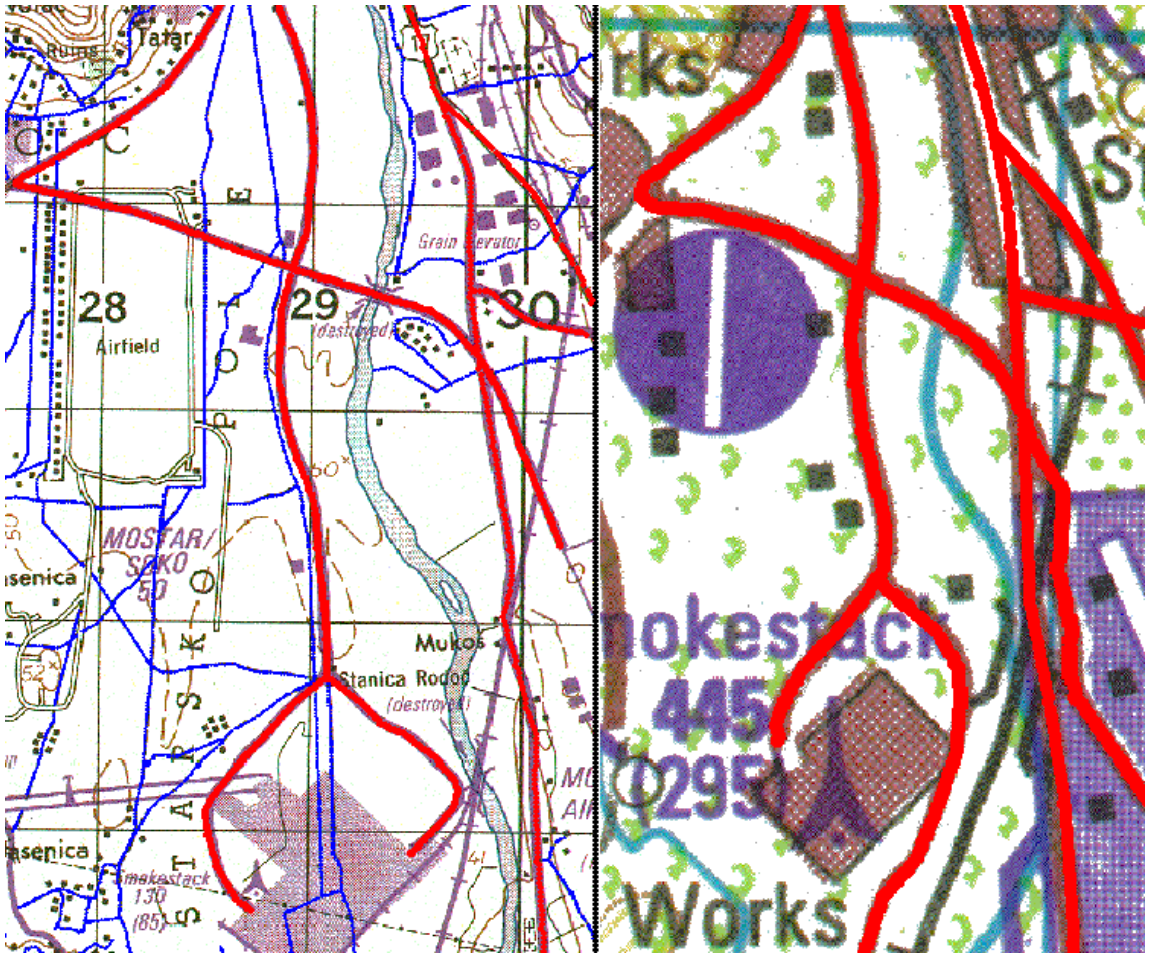
- High Resolution
  - Scale 1:100,000, 1:50,000 plus Enhancements
  - Digital Vector Source: ITD
  - Data added by TFG inference of unobserved features and iterative prediction of ever-smaller areas of focus

Spatial Data Management - Feature Linking

- Automatically determine features that are the same across database levels
  - calculate certainty of matching features
- Increase thematic and attribution information

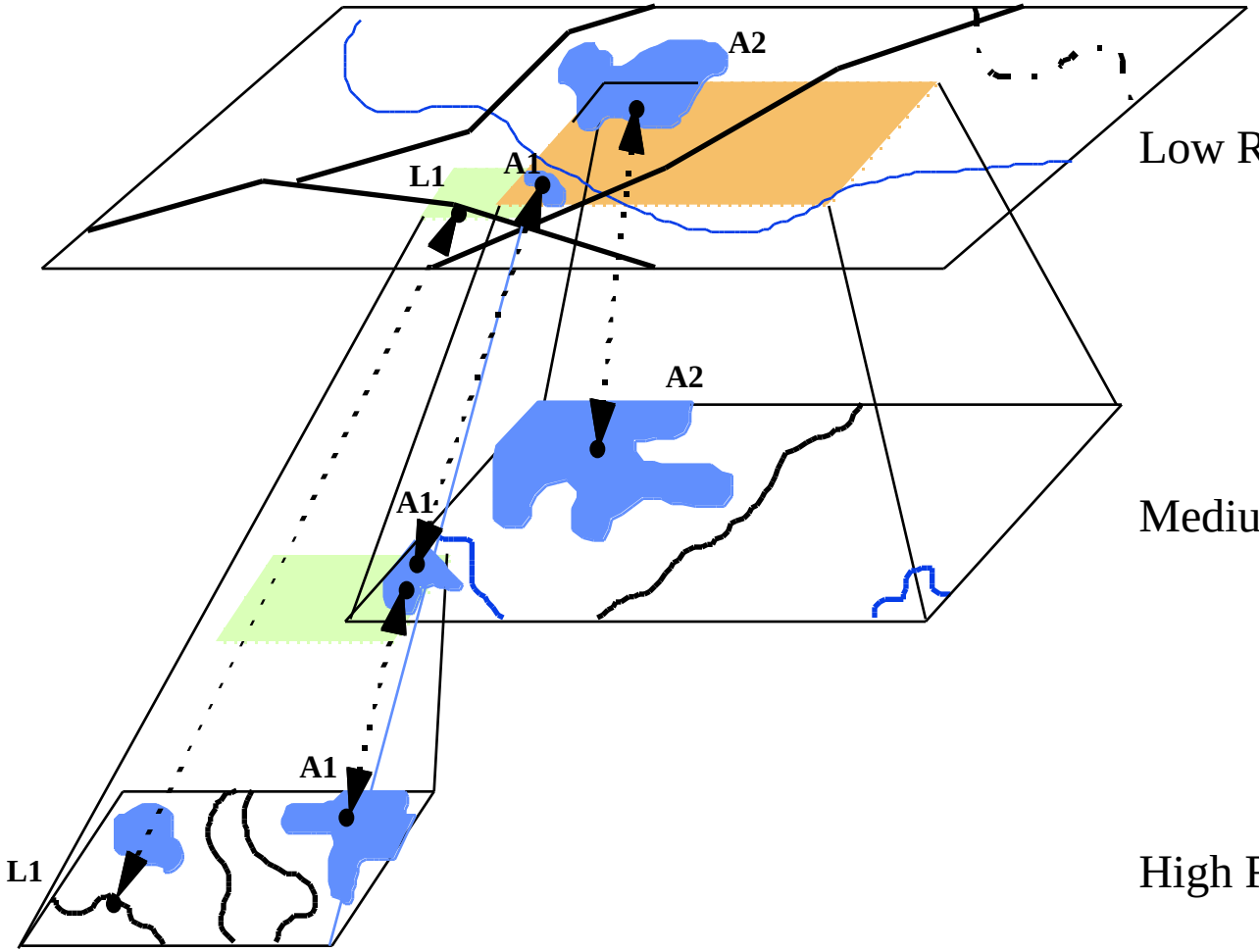
Spatial Data Management - Feature Linking

TLM



JOG

Spatial Data Management - Feature Linking



Low Resolution

Medium Resolution

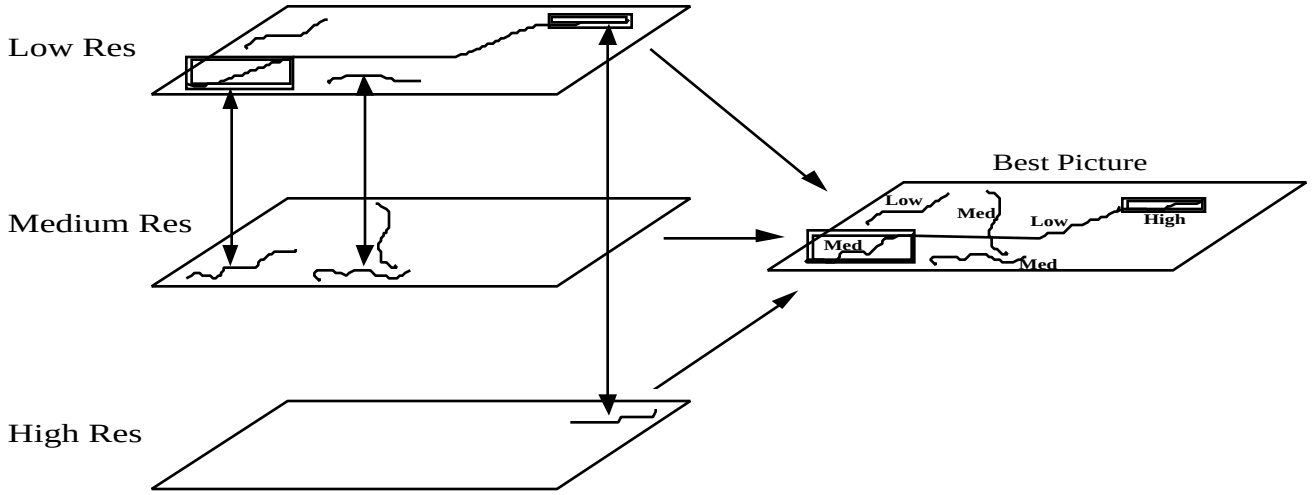
High Resolution

Spatial Data Management - Output Support

- End-user selected format for dissemination
  - VPF, TFG-enriched VPF, DTED, RPF
- End-user specified output content
  - Low, Medium, High Resolution
  - “Best Picture”

Spatial Data Management - Output Support

- Creation of a “Best Picture” output over a specified geographic region of interest



Spatiotemporality

- Intergraph invested 1995 Internal Research and Development Funds
- Two unique data input sources:
  - Meteorological Data
  - Battle Damage Assessment
- Features are characterized by their behavior and location in time and space

Spatiotemporality

- TFG is currently designed (IOC) to provide the basis for a full-scale spatiotemporal system
  - Timestamping of features & attributes
  - Historical versioning of features & attributes
  - Date & time based user queries

Summary

- TFG's Spatial Data Management represents a unique combination of database technology, GIS capability & spatiotemporality research
- TFG's IOC availability is September 1997